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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

December 15, 1994

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Allocation of Spectrum Below	)	Docket 94-32
5 GHz Transferred from	)	
Federal Government Use	)	

COMMENTS OF MICROSOFT CORPORATION

Microsoft Corporation is a world leader in the design, development and manufacture of computer software products for use in a variety of applications and market areas. Microsoft foresees present and future products that require the use of unlicensed wireless data and voice communications technology. These products require unlicensed, ad hoc access to adequate radio spectrum for wireless data communications networks. Low-cost, unlicensed wireless access will play a critical role in the development of the National Information Infrastructure, leading to improvements in business, government, health care and education.

Uses of the 2400-2483 MHz band

The 2400-2483 MHz band is an important public asset in its use for consumer microwave ovens and low power unlicensed communications devices. Millions of wireless communication devices have already been deployed for use at 902-928 MHz band. Because this band is quickly filling with innovative products, and because of serious concerns about the impact of AVM systems on the future viability of the 902-928 MHz

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band, the spectrum at 2.4 GHz is essential to continued growth of this market to meet public demands for wireless connectivity.

The types of products that the computer industry is developing include:

- Wireless local, campus, regional and wide area networks;
- Wireless handheld and pocket computers;
- Wireless remote network access support for notebook and future handheld computing devices;
- Wireless digital voice links;
- Wireless remote facsimile transmission (FAX);
- Wireless image communications;
- Wireless data broadcasting and information delivery;
- Wireless electronic mail delivery and personal messaging;
- Wireless remote control systems;
- Wireless multimedia applications;
- And many new devices and applications that are yet to be envisioned.

By the end of the decade this broad category of wireless local area products will be a multi-billion dollar industry - but only if access to adequate radio spectrum is provided, including significant provisions for unlicensed wireless data services.

The 2.4 GHz band, together with the other Part 15 allocations, is critical to the development of these new products. The 2.4 GHz band is the only band where cost effective *high speed* wireless LAN devices can be deployed today. The unlicensed PCS spectrum at 1910 to 1930 MHz will not be available for many years due to the complexity of clearing that allocation of incumbent microwave users. It is also restricted to extremely short distance connectivity. Moreover, the spectrum etiquette specified for PCS devices prohibits spread spectrum operation. Clearly, the 1910 to 1930 MHz band will not be appropriate for *high speed* wireless local area networks.

The IEEE, through the 802.11 standards committee, has established standards for frequency hopping spread spectrum high speed wireless data local area networking in the entire 2.400 to 2.485 GHz frequency band. Wireless LAN devices are already manufactured and sold for operation in this band.

The 2.4 GHz band is allocated world wide for use by microwave ovens. As such, the 2.4 GHz band is a de facto international standard - and the only internationally available band for this type of operation. The potential world-wide market for 2.4 GHz devices provides for a mass market, enabling the production of high volume, low cost connectivity products.

While additional frequencies are available at 5.8 GHz, it is not possible, within the foreseeable future, to manufacture devices for use in this band at a sufficiently low cost to make wireless LAN technology a success. For these reasons, continued access and use of the entire 2400 to 2483.5 MHz allocation must be maintained.

In Docket 93-61 the FCC has proposed rule makings concerning Automatic Vehicle Monitoring (AVM) systems that may have extremely detrimental impacts to the continued, successful operation of low power, unlicensed devices in the 902-928 MHz band. The uncertainty of continued access to this band by the millions of existing Part 15 devices makes preservation of the 2.4 GHz band even more critical to the success of unlicensed connectivity applications.

<u>2402-2417 MHz is already in use by the general public.</u>

In Docket 94-32, the FCC has proposed that the band segment 2402-2417 MHz be allocated to other uses based on the Congressional directive to select surplus, primary use, federal government frequencies below 5 GHz for reallocation to the public sector.

The 2402-2417 MHz segment is allocated to government radiolocation service as a primary user, however the band is also used on a primary basis by ISM devices, on a secondary basis by the Amateur Radio service, and on an unlicensed basis by Part 15 devices. This spectrum clearly does not meet the intent of the directive to select surplus federal government spectrum for reallocation. This spectrum is extensively used by the public today. The proposed reallocation would produce no net gain in public access to spectrum, even though the NTIA requires that new allocations achieve an increase in public benefit over the current allocation. Therefore, the proposed reallocation is not a surrendering of excess government spectrum and does not meet the requirements established by Congress or the NTIA.

The Impact of High Noise Levels in the 2402-2417 MHz segment

Microwave ovens are the predominate user of the 2.4 GHz band, producing a high ambient noise level in the band. With deployment of Part 15 frequency hopping transmitters, the ambient noise level will get higher. This suggests that any commercial services operating in the proposed reallocation at 2402-2417 MHz must use high power transmitting equipment to overcome noisy radio conditions. High power means higher cost equipment and potential adverse health effects. Further, high power operation in this segment of the band will adversely impact Part 15 receivers in the adjoining Part 15 segments through receiver overload and desensitization and intermodulation products.

Bands that have high noise characteristics can, however, be operated satisfactorily by low power, short distance communications devices as has been proven through the implementation of 2.4 GHz wireless LAN products. Therefore, the noise characteristics of the 2402-2417 MHz band segment are inconsistent with the quality requirements of commercial services but are acceptable for use by unlicensed, low power, short range communicators, many of which employ innovative techniques to minimize the impact of radio frequency noise.

Regarding the Proposed Reallocation of 2390-2400 MHz

The FCC has also proposed reallocation of the 2390 to 2400 MHz band segment to the private sector. This band is presently allocated on a secondary basis to the Amateur service. Because this band has similar noise characteristics to the 2.4 GHz band, we do not see how this band can be used for commercial services, as described in the previous section of our comments. Instead, we urge that this band segment be retained for use by the Amateur service but additionally be opened to the use of low power unlicensed devices intended for short range communication. IBM[1] notes that it "designed the IBM Wireless LAN with special design attributes that....allow it to operate without substantial interference from the amateur radio operators and other ISM equipment currently operating in the 2400 MHz band." The Amateur Radio service has a long history of successfully sharing spectrum with other users, especially Part 15 users. Therefore, we recommend that the segment 2390 to 2400 MHz be added to those bands suited for Part 15 devices and that the Amateur service be retained in this band segment.

No Commercial Users of 2402-2417 MHz Have Been Identified

At this time, no significant commercial users of the 2402 to 2417 MHz band segment have been identified, particularly because of the problems with high noise levels in the band. There is today a market demand for Part 15 wireless devices, particularly wireless LAN transceivers, in the entire band segment from 2400 to 2483.5 MHz. No rational reason has been identified to eliminate existing Part 15 users of this band and set aside the frequencies for other uses that are yet to be identified. Before such reallocation should be even considered, a clear customer for these frequencies must be identified. Suggestions to use the 2402-2417 MHz band for "image communications" have been made but provide no specific reason why the 2402-2417 MHz band is well suited to such purposes - there are many other microwave frequencies that may also be used for such functions. Without clear user benefits, the 2402-2417 MHz band should not be reallocated.

[1] Reply Comments of International Business Machines Corporation in ET Docket 94-32, page 9

Existing Part 15 Access to the Band Has Produced Significant Innovation

The existing Part 15 rules for unlicensed operation provide for innovation in technology. Because there is little delay in seeking regulatory approval for unlicensed devices, equipment manufacturers have deployed extraordinarily innovative technology in the Part 15 bands such as high speed and frequency hopping wireless LAN technology that is capable of handling the high interference load present within the band. The Commission must continue to support the innovation that is taking place today and continue to encourage the growth of this powerful industry.

The Commission's existing rules in 15.247 require frequency hoppers to hop over the entire allocated bandwidth. Removing a section of the band for other uses unnecessarily complicates such devices and harms their ability to be used to their full potential.

Conclusion

The proposed allocation at 2402-2417 MHz is inconsistent with the goal of turning over surplus government frequencies to the public as the band is now used by members of the public through existing Part 15 devices. Converting this band segment to commercial use produces minimal benefits due to the high ambient noise levels in the band and harms the growth of some of the most promising and innovative technologies that are being conducted with spread spectrum technology.

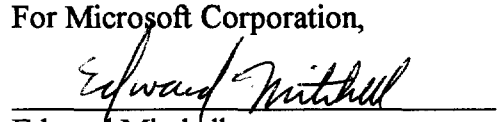
For the reasons outlined above, Microsoft recommends that:

- The band segment from 2402-2417 MHz be retained for use by Part 15 devices;
- The band segment should not be authorized for high power commercial operation;
- The band segment 2390-2400 MHz should be added to the existing Part 15 allocation extending from 2400 to 2483.5 MHz;
- The band segment 2390-2400 MHz should be regulated under Part 15.247 allowing for spread spectrum operation up to 1 watt output power.

If the FCC does decide to make a reallocation of the 2402-2417 MHz spectrum it must be implemented in such away as to protect the incumbent users of the spectrum, including Part 15 users. Further, as directed by Congress, the FCC's choice of spectrum must not be based on an expectation of auction revenue and must represent a net gain of spectrum to the public, not just an exchange of one public use for another public use.

There are precious few bands allocated for ad hoc, uncoordinated, unlicensed devices and high speed wireless data operations. All such bands are shared allocations. The Commission must take all reasonable steps to encourage continued unlicensed device operation over all existing Part 15 allocations. Full access to these bands is critical to the future growth of mobile computing and the success of ubiquitous access to the National Information Infrastructure

For Microsoft Corporation,



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